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10/685,883	10/15/2003	Arne Reykowski	P03,0422	5940

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EXAMINER
VARGAS, DIXOMARA

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2859	

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Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

AK

Office Action Summary	**Application No.** 10/685,883	**Applicant(s)** REYKOWSKI ET AL.	
	Examiner Dixomara Vargas	**Art Unit** 2859	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 March 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-38* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,7,10,11,14,15,17-23,27,30,31 and 38* is/are rejected.

7)☒ Claim(s) *2-6,8,9,12,13,16,24-26,28,29 and 32-37* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 7, 10, 11, 14, 15, 17-23, 27, 30, 31 and 38 are rejected under 35 U.S.C. 102(b) as being anticipated by Srinivasan et al (US 5,543,711 A).

With respect to claims 1, 7, 10, 14, 15, 17-23, 27, 30, 31 and 38, Srinivasan discloses a method for forming at least two modes for a magnetic resonance imaging apparatus comprising the steps of: receiving at least two magnetic resonance response signals respectively with at least two local antennas (Column 4, lines 41-44, Figures 5 and 6, coils #42, #130 and #132), generating a primary mode by combining said received magnetic resonance response signals in a first weighted linear combination, said primary mode corresponding to a magnetic resonance signal of an amplitude-controlled and phase-controlled group antenna exhibiting a first sensitivity distribution that is optimized for a target region within a detection volume of said local antennas, and generating a secondary mode by combining said received magnetic resonance response signals in a second weighted linear combination, said secondary mode corresponding to a magnetic resonance signal of an amplitude-controlled and phase-controlled group antenna exhibiting a second sensitivity distribution that is different from said first sensitivity distribution in a phase coding direction of said response signals (Columns 4 and 5, lines 41-67 and 1-5 respectively; Abstract).

3. With respect to claim 11, Srinivasan discloses the step wherein at least two of said modes are orthogonal relative to each other (Columns 2-3, lines 64-67 and 1-2 respectively).

Allowable Subject Matter

4. Claims 2-6, 8, 9, 12, 13, 16, 24-26, 28, 29 and 32-37 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

5. The following is a statement of reasons for the indication of allowable subject matter:

a. With respect to claim 2, the claim has been found allowable over the prior art of record because the prior art of record fails to teach or fairly suggest a method for forming at least two modes for a magnetic resonance imaging apparatus from at least two magnetic resonance response signals respectively with at least two local antennas, comprising the step of generating said primary mode using said first weighted linear combination with a linear coefficient dependent on a geometric position of said local antennas relative to said target region in combination with the remaining limitations of claim 1 above.

b. With respect to claim 3, the claim has been found allowable over the prior art of record because the prior art of record fails to teach or fairly suggest a method for forming at least two modes for a magnetic resonance imaging apparatus from at least two magnetic resonance response signals respectively with at least two local antennas, comprising the step of generating said primary mode with said first weighted linear combination having respective factors, selected from the group consisting of weighting factors and phase factors, applied to the respective signals from the local antennas, representing an influence of the target region on that local antenna selected from the group consisting of a distance of that local antenna from the target region and an angle of that local antenna relative to the target region in combination with the remaining limitations of claim 1 above.

c. With respect to claim 4, the claim has been found allowable over the prior art of record because the prior art of record fails to teach or fairly suggest a method for forming at least two modes for a magnetic resonance imaging apparatus from at least two magnetic resonance response signals respectively with at least two local antennas, comprising the step of generating said primary mode with said first weighted linear combination having respective phase factors applied to said response signals representing a sensitivity of the local antenna, from which the respective response signal was received, in the target region relative to a phase of the magnetic resonance emission from said target region in combination with the remaining limitations of claim 1 above.

d. With respect to claim 5, the claim has been found allowable over the prior art of record because the prior art of record fails to teach or fairly suggest a method for forming at least two modes for a magnetic resonance imaging apparatus from at least two magnetic resonance response signals respectively with at least two local antennas, comprising the step of generating a magnetic ratio, from said primary mode, and resonance image, exhibiting a signal-to-noise employing at least one coefficient in said first linear weighted combination that optimizes said signal-to-noise ratio of said image in said target region in combination with the remaining limitations of claim 1 above.

e. With respect to claim 6, the claim has been allowed due to its dependency on claim 5 above.

f. With respect to claim 8, the claim has been found allowable over the prior art of record because the prior art of record fails to teach or fairly suggest a method for forming at least two modes for a magnetic resonance imaging apparatus from at least two magnetic resonance response signals respectively with at least two local antennas, comprising the step of employing at least one coefficient in said third weighted linear combination that optimizes a signal-to-noise ratio in a further target region, different from said target region, in an image produced by parallel imaging with said primary, secondary and tertiary modes with an acceleration facto of 3 in combination with the remaining limitations of claims 1 and 7 above.

g. With respect to claim 9, the claim has been found allowable over the prior art of record because the prior art of record fails to teach or fairly suggest a method for forming at least two modes for a magnetic resonance imaging apparatus from at least two magnetic resonance response signals respectively with at least two local antennas, comprising the step of selecting a preliminary secondary mode and a preliminary tertiary mode that are orthogonal to each other and orthogonal to said primary mode, and generating said secondary mode as a linear combination of said preliminary secondary mode and said preliminary tertiary mode; to optimize a signal-to-noise ratio in a further target region, different from said target region, in an image produced by parallel imaging with said primary mode and said secondary mode with an acceleration factor of two in combination with the remaining limitations of claims 1 and 7 above.

h. With respect to claim 12, the claim has been found allowable over the prior art of record because the prior art of record fails to teach or fairly suggest a method for forming at least two modes for a magnetic resonance imaging apparatus from at least two magnetic resonance response signals respectively with at least two local antennas, comprising the step of generating at least four magnetic resonance response signals from a number of local antennas that is at least four, up to a number of response signals equal to said number of local antennas, and for each additional further linear combination of said response signal, forming one further mode by a response signals, each further mode optimizing a signal-to-noise ratio in a selected further target region, different from said target region, in an image obtained by parallel imaging with all of said modes with an acceleration factor corresponding to the number of said modes in combination with the remaining limitations of claim 1 above.

i. With respect to claim 13, the claim has been allowed due to its dependency on claim 12 above.

j. With respect to claim 16, the claim has been found allowable over the prior art of record because the prior art of record fails to teach or fairly suggest a method for forming at least two modes for a magnetic resonance imaging apparatus from at least two magnetic resonance response signals respectively with at least two local antennas, comprising the step of selecting said target region by selecting at least one coefficient in at least one of said first weighted linear combination and said second weighted linear combination in combination with the remaining limitations of claim 1 above.

k. With respect to claim 24, the claim has been found allowable over the prior art of record because the prior art of record fails to teach or fairly suggest a reception unit for a MRI apparatus comprising a combination network applies a linear coefficient to one of said antenna signals, in said linear combination in combination with the remaining limitations of claim 22 above.

l. With respect to claim 25, the claim has been allowed due to its dependency on claim 24 above.

m. With respect to claim 26, the claim has been found allowable over the prior art of record because the prior art of record fails to teach or fairly suggest a reception unit for a MRI apparatus comprising a combination unit that generates one of said modes as a mode corresponding to a signal of an antenna having a geometry to receive a spatial field structure that is not individually receivable with any one of said local antennas in combination with the remaining limitations of claim 22 above.

n. With respect to claim 28, the claim has been found allowable over the prior art of record because the prior art of record fails to teach or fairly suggest a reception unit for a MRI apparatus comprising a network that comprises a signal combination unit having two inputs and two outputs, with respective signals from said at least two antennas being supplied to respective inputs, the signals at the respective inputs being added with a first linear coefficient without a phase difference to produce a signal at one of said outputs and being added with a second linear coefficient with a phase difference to produce a signal at the other of set outputs in combination with the remaining limitations of claim 22 above.

o. With respect to claim 29, the claim has been allowed due to its dependency on claim 28 above.

p. With respect to claim 32, the claim has been found allowable over the prior art of record because the prior art of record fails to teach or fairly suggest a reception unit for a MRI apparatus comprising at least three local antennas include two laterally arranged local antennas, the respective signals received thereby being supplied to the first and second of the inputs of said first signal combination unit and a third local antenna disposed between the laterally arranged local antennas, said third antenna generating said third antenna signal, and wherein said first signal combination unit adds the respective signals of said two laterally arranged local antennas with a weighting factor of $2^{-1/2}$ without a phase difference to 'produce a secondary mode and adds the signals of the two laterally local antennas with a weighting factor of $2^{-1/2}$ and with a phase difference of arranged 180° to produce said signal at "the second of the outputs of said first signal combination unit, and wherein said second signal combination unit adds the signal from the second of the outputs of said first signal combination unit with said third antenna signal from said third local antenna with a weighting factor of

$2^{-1/2}$ and with a phase difference of 90° and a weighting factor of $2^{1/2}$, to generate a tertiary mode, and adds said signal from the second of the outputs of said first signal combination unit with said third antenna signal from said third local antenna with a phase difference of -90^0 to generate a primary mode in combination with the remaining limitations of claims 22 and 30.

q. With respect to claim 33, the claim has been found allowable over the prior art of record because the prior art of record fails to teach or fairly suggest a reception unit for a MRI apparatus comprising at least three local antennas include two laterally arranged local antennas, the respective signals received thereby being supplied to the first and second of the inputs of said first signal combination unit and a third local antenna disposed between the laterally arranged local antennas, said third antenna generating said third antenna signal, and wherein said first signal combination unit adds the respective signals of said two laterally arranged local antennas with a weighting factor of $2^{-1/2}$ with a phase difference of 60^0 to produce a secondary mode and laterally arranged local antennas with a adds the signals of the two weighting factor of $2^{-1/2}$ with a phase difference of 120^0 to produce said signal at the second of the outputs of said first signal combination unit, and wherein said second signal combination unit adds the signal from the second of the outputs of said first signal combination unit with said third antenna signal from said third local antenna with a phase difference of 60^0 and a weighting factor of $2^{1/2}$ to generate a primary mode, and adds said signal from the second of the outputs of said first signal combination unit with said third antenna with a weighting factor of $2^{-1/2}$ with a phase signal from said third local antenna an difference of 120^0 to generate a tertiary mode in combination with the remaining limitations of claims 22 and 30.

r. With respect to claim 34, the claim has been found allowable over the prior art of record because the prior art of record fails to teach or fairly suggest a reception unit for a MRI apparatus comprising a first and second signal combination units that are substantially reflection-free in combination with the remaining limitations of claims 22 and 30.

s. With respect to claim 35, the claim has been found allowable over the prior art of record because the prior art of record fails to teach or fairly suggest a reception unit for a MRI apparatus comprising a first and second signal combination units are substantially lossless in combination with the remaining limitations of claims 22 and 30.

t. With respect to claim 36, the claim has been found allowable over the prior art of record because the prior art of record fails to teach or fairly suggest a reception unit for a MRI apparatus comprising one of said first and second signal combinations is a hybrid unit in combination with the remaining limitations of claims 22 and 30.

u. With respect to claim 37, the claim has been allowed due to its dependency on claim 24 above.

Response to Arguments

6. Applicant's arguments with respect to claims 1-38 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dixomara Vargas whose telephone number is (571) 272-2252. The examiner can normally be reached on Monday to Thursday from 8:00 am. to 4:30 pm..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez can be reached on (571) 272-2245. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Dixomara Vargas
Art Unit 2859
June 11, 2005

6.13.05
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